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SCIENCE

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CONTENTS

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ON THE RELATIONS OF ANTHROPOLOGY AND PSYCHOLOGY[1]

IF we are to compare two objects and study their relations, we will naturally want data as to their dimensions, their composition, and their observed influence upon each other. In comparing two branches of science we should thoroughly know their scope, the intrinsic work and the tendencies of each, and their mutual interplay and cooperation. This stipulates, in the first place, a clear definition of both of the branches concerned; in the second, a good acquaintance with their workings and their possibilities; and lastly, a possession of some satisfactory measure of the field of activities of each of the two branches for direct comparison.

In considering the relations of anthropology and psychology, the conditions just named are regrettably, not all fulfillable. We are fairly clear to-day as to the definition of scope, and work done, as well as doing and to be done, in physical anthropology; but we are less clear in these respects when it comes to other subdivisions of the "science of man," and matters are even less satisfactory when we approach psychology.

In a general way, we all feel that psychology and anthropology are related. The very existence of this joint Section, as well as that of the joint committee of our two branches in the National Research Council, are sufficient proofs of this feeling, in this country at least. We all know also that anthropological studies of human activities, both in the far past and at present, the studies of language, beliefs, ceremonies, music and habits, as well as the studies upon the human and animal brain and on the sense organs and their functions, are

[1] Address of the vice-president and chairman of Section H—Anthropology, American Association for the Advancement of Science, St. Louis, December, 1919.

of direct and intense concern to psychology; while on the other hand we are equally aware of the fact that many of the studies of the psychologists, such as those on hereditary and group conditions, and on behavior of primitive peoples are of considerable interest to anthropology. But when we examine more closely into these relations, we meet with various setbacks and difficulties. We soon see, although again only in a general way, that the psychologists and anthropologists of whatever shade of color can and do exist quite independently; that they actually work to a very large extent unknown to each other; that as time goes on they associate rather less than more at the colleges and universities; that they progressively drift further apart in nomenclature, methods and other respects, and that in no important way are they really coming closer together. No one, I am sure, would claim that if every anthropologist disappeared to-day, psychology could not go on as well as it has hitherto; and no one could claim on the other hand, that anthropology could not exist without the aid of psychology.

In our institutions the two branches proceed to-day, as well known to all of us, quite independently. Our great museums all have their departments of anthropology, but none that of psychology; while in some of the colleges, in the War Department, and the Public Health Service, matters are the reverse. The publications of one of the branches are scarcely known to the workers in the other, and barring rare exceptions there is no thought of exchanges, references or mutual reviewing of literature. The terminology is divergent, instruments and methods differ; our most important international congresses and relations are wholly distinct; at our meetings we mingle only through courtesy and habit; and as has well been shown during the years of war there was no actual cooperation of the two branches in this greatest of contingencies, and but little concern in one of what the other might be doing or planning. If the anthropologist takes up the list of psychological publications such as furnished by the Psychological Index he will note that as this proceeds from year to year it progressively drops reference to anthropological publications; and the same condition is observable in the anthropological bibliographies in relation to what may be considered more strictly psychological work.

It is also known to you that for several years now increasingly strong efforts have been put forward from both sides to separate in this association anthropology from psychology and have each form its own section, efforts which now have been successful.

Bearing all this in mind we can not help asking: Is there really any relation of consequence between modern anthropology and psychology?

There is indeed such a relation; but it has never thus far been sufficiently defined and never as yet sufficiently exploited. This relation is of such a nature, that during the preliminary and earlier work in both branches it could and had to be neglected; but as psychology progresses it will grow in strength, to eventually become of importance.

I may be permitted, in the first place, to point out the areas of contact and interdigitation of the two branches.

Unfortunately, I meet here with the serious initial difficulty of defining psychology. After striking this snag in the preparation of my address, I turned to a series of the foremost representatives of your science for help, and the help did not materialize. Some of those appealed to would give no definition; others would attempt it only circumstantially, so that it was of little use for my purpose; while the rest defined or inclined to define psychology as the "science of behavior," which characterization does not seem to be sufficiently comprehensive.

I then turned to the publications given in the last few volumes of the Psychological Index and particularly the volume for 1918, which presumably is the most representative. It gives 1,585 titles. Out of these I found, so far as I could judge from the titles, 14 per cent. dealing with neurology and physiology; 28 per cent. dealing with neuropathology and psychiatry; 6.5 per cent. dealing with sociology, ethics, and philosophy; 2.5 per cent. with

religion, mysticism, and metaphysics; 3.5 per cent. of the titles were mixed and indefinite; 4 per cent. dealt with animal psychology; 36 per cent. with human psychology; and 6.5 per cent. with what approached physical and general anthropology.

I found further that the publications included in your index, and hence those in which you are interested, range from anatomy and histology of the nervous system to mathematics on the one hand and metaphysics on the other, covering practically the whole vast range of phenomena relating to the nervous system and mental activities of man and animals. This shows indefiniteness, incomplete crystallization.

As psychology advances, its field will doubtless become better differentiated, and possibly separated into a number of special subbranches. When this happens the relations of the various subdivisions of psychology and those of anthropology will be more evident and easier of precision. It will then be found that your anatomical and physiological section will have many points of contact with physical anthropology, while your sections on behavior, beliefs, habits, dreams, etc., will connect in many respects with the anthropological studies which are to-day grouped under the terms of ethnology and ethnography.

However, even such clarified relations would be of no great importance, were it not for the fact that psychology must as time passes on enlarge the scope of its activities, until no small part of these shall really become anthropological.

And here I must define anthropology. Its old definition as the "science of man" is not sufficient, being too comprehensive and too indefinite. But if you will examine the activities in any branch of anthropology, you will find that although they deal with a vast array of subjects they are all characterized by certain something distinctive, and this is the *comparative* element. Anthropology is essentially a science of comparisons. It is comparative human anatomy, physiology, psychology, sociology, linguistics, etc. And being comparative it does not deal with individuals or mere abstract averages, but with groups of mankind, whether these are social, occupational, environmental, racial, or pathological. In brief, it is the science of human variation, both in man himself and in his activities.

Let us now return to psychology. In the course of its development, psychology will unquestionably find its choicest field in group studies. It has already begun in this direction. It compares classes with classes, as during the late war; it will enter in the not far distant future into race psychology; and it will compare other definite human groups with groups, study their variations and the causes of these, study evolution, involution, and degenerations of the nervous organs of mankind as a whole—and all this will be or be very near to anthropology.

A word in conclusion. Anthropology and psychology as they are to-day, are fairly independent branches of scientific activities, with no closer actual bonds and interdependence than those that exist, for instance, between either of them and sociology, or history. But in their further development and particularly that of psychology, the two branches will approach closer together until an important part of their activities will be in the same orbit.

A. HRDLIČKA

THE FUNCTIONS AND IDEALS OF A NATIONAL GEOLOGICAL SURVEY. II

Kinds of Work to be Undertaken by a National Geological Survey.—There has been considerable difference of opinion as to the kinds of work that should be undertaken by a national geological survey. Shall its field be confined to what may be included under geology or shall it embrace other activities, such as topographic mapping, hydrography and hydraulic engineering, mining engineering, the classification of public lands, the collection and publication of statistics of mineral production and the mechanical arts of publication such as printing and engraving. These various lines of activity may be divided into two main classes—those that are more or less contributory to or subordinate to the publi-

cation of geologic results, and those that have little if any connection with geology.

The speaker is one of those who believe that a geological survey should be essentially what its name implies—that it should confine its activity to the science of geology. This opinion is held, however, in full realization of the fact that here as elsewhere some compromise may be necessary. This may be dictated by law or may be determined by policy.

The organic law of the U. S. Geological Survey, for example, includes among the duties of the organization "the classification of the public lands." There may be some difference of opinion as to what the framers of the law meant by this provision, but it is at least a reasonable conclusion that they intended the sort of classification adopted by the General Land Office. If so, the determination of the so-called "mineral" or "non-mineral" character of public lands is undoubtedly a proper function of the U. S. Geological Survey, although it is one that was neglected by that survey for many years and has not yet received the recognition of a specific appropriation, except recently, in connection with the stock-raising and enlarged homestead acts.

Topographic Mapping.—Inasmuch as the preparation of a topographic map is a necessary preliminary to accurate and detailed geologic mapping, a geological survey is vitally interested in seeing that satisfactory maps are available as needed. Whether the national geological survey should itself undertake this mapping depends upon circumstances. If another government organization is equipped for doing this work and can provide maps of the requisite quality when needed, it would appear that the geological bureau should leave this work to the other organization, particularly as the maps required to keep abreast of geologic requirements are likely to constitute only a part of the work of the topographic bureau. There are certain decided advantages, however, in having the topographic work done by the geological survey and these advantages must be weighed against other considerations. With the topographic and geologic work under a single control, the geologist is more likely to be assured of getting the kind of map desired at the time needed. Cooperation between geologists and topographers is apt to be both closer and more flexible than were the two staffs in separate organizations. Finally the field work in topography and geology is in some respects alike and is carried out by similar methods and equipment. Occasionally the two kinds of work can be combined and carried on simultaneously.

The general question, Whether a national geological survey shall do its own topographic mapping, appears to be one that can not be answered once for all but must be determined for each country. In an old country where accurate and detailed maps have long been made by military and other organizations, a geological survey may be under no necessity of providing its own topographic base maps. In a new country, where exploration is still in progress, the geological survey may have to make its own topographic surveys. The The main point, as I see it, is that the geological survey must have maps of the standard required by it with the least possible delay, but should not undertake to make them itself if other organizations that can and will provide the maps needed are already in the field.

We have seen that there is at least a very close connection between topographic and geologic mapping and that in this relation may lie a sufficient reason why both kinds of work should be undertaken by the same organization. Is there as good a reason why the study of geology and the collection of statistics of mineral production should be united?

Statistics of Mineral Production.—When shortly after the organization of the U. S. Geological Survey the collection of statistics was begun, those geologists who were most influential in urging that the survey should undertake statistical work adduced as the principal reason that the people desired such figures and if the Geological Survey did the work it would be able to secure larger appropriations than if the task were left for others.

It does not appear to have been thought at that time that geologists were the only men who could satisfactorily do statistical work or that it was necessary to impose this task on them. Subsequently, however, the work was apportioned among the geologists. The reasons for this step appear to have been first, that the results of having the statistical reports prepared under contract by specialists who were not on the regular staff of the organization had proved unsatisfactory; second, that by apportioning the work among the geologists already on the staff not only would the apparent cost in money be less than under the former arrangement, but it would, in a book-keeping sense, be very much cheaper than taking on new men for this particular work; finally, it was argued that geologists could apply their knowledge of the field relations of ore deposits to improve the character of statistical reports and would themselves benefit by additional opportunities to visit and examine many deposits that they might not otherwise see.

It is undoubtedly true that the statistical reports of the United States Geological Survey have greatly improved in accuracy, fullness, and general interest since this plan was adopted. It is also true that some geologists have turned their opportunities as statistical experts to good account both in enlarging their experience and by gathering material that has been worked into geological papers. Nevertheless, the policy has, in my opinion, been a mistake both economically and scientifically. It has insidiously filched the time of highly trained men who have shown originality and capacity for geologic research and has tied these men down to comparatively easy and more or less routine tasks. Some geologists who were once scientifically productive no longer contribute anything to geological literature but are immersed in work that men without their special geological training could do as well. To a certain extent the policy is destructive of scientific morale. A young geologist sees that a man who publishes annually or at shorter periods reports on the statistics of production of some metal becomes widely known to all interested in that metal and is considered by them as the United States Geological Survey's principal expert on that commodity. This easily won recognition, with all that it implies or seems to imply in the way of promotion and of industrial opportunity must constitute a real temptation so long as a scientific man is expected to contribute his own enthusiastic devotion to science as part payment of his salary. The incidental geological opportunities offered by statistical work are found chiefly in connection with a few of the minor mineral resources, rather than with such industrially dominant commodities as petroleum, iron or copper, and these opportunities for the individual geologist are soon exhausted and are likely to be purchased at a price far out of proportion to their value. The supposition that geological training is essential for good statistical work in mineral products is a fallacy, and no man who shows promise of making real contributions to geologic science should be placed in such circumstances that he is virtually forced to worship an idol whose head may be of gold and precious stones but whose feet are assuredly of clay. I am emphatically of the opinion that the collection of mineral statistics is not logically a function of a national geological survey. If, however, such a survey is committed to this task by law, by the lack of any other organization to do the work, or by well considered reasons of policy, then it is even more certain that the duty should not devolve upon geologists at the expense of their own science, but should be cared for by a special staff. Some cooperation between the statistical staff and the geologic staff may be advisable but the extent of this cooperation should be determined by those fully alive to the necessity of safeguarding geology against encroachments by statistical work.

Water Resources.—Studies concerned with the occurrence of underground water are of course as much geological as those concerned with the occurrence of petroleum. Investigations of surface waters, however, including stream gaging and the study of water-power

come within the field of engineering and have so little connection with geology that it is difficult to see any logical ground for their inclusion within the group of activities belonging properly to a geological survey. In an ideal apportionment of fields of endeavor among the scientific and technical bureaus of a government, stream gaging and estimation of water-power would scarcely fall to the national geological survey. As it happens, the United States Geological Survey does perform these functions and I am not prepared to say that there is not ample legal and practical justification for this adventitious growth on a geological bureau. There has been little or no tendency to draft geologists into hydraulic engineering and consequently the principal objection urged against the inclusion of statistical work within the sphere of a geological survey does not here apply. Apparently the only practical disadvantages are the introduction of additional complexity into a primarily scientific organization and the consequent danger of the partial submergence of principal and primary functions by those of adventitious character.

It should be pointed out in this connection that certain studies of surface waters, especially those that are concerned with the character and quantity of material carried in suspension and in solution in river waters, have much geological importance. Such studies supply data for estimating the rate of erosion and sedimentation. They are to be regarded, however, rather as an illustration of the way in which geology overlaps other branches of science and utilizes their results than as reason for considering hydraulic engineering as normally a function of a geological survey.

Foreign Mineral Resources.—One of the results of the war was to suggest the advantage to the citizens and government of the United States of a central source of information concerning the mineral resources of foreign countries. The United States Geological Survey undertook to gather this information, primarily for the specific purpose of supplying data to the American representatives at the Peace Conference. As the director of the survey states in his fortieth annual report:

> Two general purposes were served—first that of obtaining a clear understanding of the relations between our own war needs and the foreign sources of supply from which these needs must or could be met; second, that of obtaining an understanding of the bearing of mineral resources upon the origin and conduct of the war and upon the political and commercial readjustments that would follow the end of hostilities.

This work, of a kind that so far as known had not previously been undertaken by any national geological survey, has been continued with the view that it is important for those who direct American industries to possess as much information as possible concerning those foreign mineral resources upon which they can draw or against which they must compete. The results aimed at are directly practical and are largely obtained by compilation of available published and unpublished material as it is manifestly impossible to make direct detailed investigation of the mineral resources of all foreign countries. Nevertheless the work appears to fall appropriately within the field of a geological bureau and if it can be made to furnish the opportunity, hitherto lacking, for geologists in the government service to make first-hand comparison between our own mineral deposits and those of other lands the experiment will probably bear scientific fruit.

Mineralogy and Paleontology.—Mineralogy and paleontology are so closely related to geology that there can be no question of the propriety of including the pursuit of these sciences within the scope of a geological survey.

Chemistry and Physics.—The application of chemistry and physics to geological problems admits of more discussion. Chemical work, however, as carried on in connection with geological investigations is of such special character and must be conducted in such intimate contact with geological data as to make it almost certain that better results can be obtained with a special staff and equipment than would be possible were the routine

and investigative work in geological chemistry turned over to some central bureau of chemistry. The same argument is believed to be applicable also to physics. Research in geophysics was at one time a recognized function of the United States Geological Survey but since the founding of the geophysical laboratory of the Carnegie Institution of Washington, this field has been left almost entirely to that splendid organization which is unhampered by some of the unfortunate restrictions of a government bureau. Under these particular and unusual conditions this course may have been wise, although it does not negative the conclusion that, in general, investigations in geophysics are logically and properly a function of a national geological survey.

Soils.—The study of soils, with reference to origin, composition and classification, is unquestionably a branch of geology, but the geologist, with tradition behind him, generally looks upon soil as a nuisance and geological surveys have reflected his attitude. In the United States the classification and mapping of soil types has for some years been in progress by the Department of Agriculture. While quite devoid of any enthusiasm for engaging in soil mapping, I wish to point out merely that this work, if its results justify its performance by the government, and if the classification adopted is based on chemical, physical and mineralogical character rather than on crop adaptability, is properly a function of the national geological survey.

Seismology.—Another subject that is comparatively neglected by national geological surveys is seismology. It can scarcely be asserted that earthquakes have no economic bearing and conspicuous or destructive examples usually receive some official attention —after the event. The comparative neglect of systematic study of earthquakes is probably due to a number of causes. One of these is that few geologists specialize in seismology—a science in which little progress can be made unless the investigator possesses unusual qualifications in mathematics and physics. Another reason probably is that to most men the difficulties in the way of gaining real knowledge of the causes of earthquakes and especially of predicting with any certainty the time, place, intensity and effects of earthquakes appear rather appalling. Finally earthquake prediction or even the recognition of the possibility of future earthquakes in a particular part of the country is likely to have consequences decidedly unpleasant to those responsible for the prediction. Experience in California has shown that a community still staggering from a violent shaking may insist with some acerbity that nothing of any consequence has happened and that it never felt better in its life.

Notwithstanding these difficulties, I believe that a national geological survey, in a country where serious earthquakes have taken place and may occur again, should consider the collection and interpretation of seismological data as part of its duty. Such work is regional in scope and can not be carried far by local initiative and by individual investigators on their own resources. In spite of difficulties I believe that it is within the range of possibility that some day we shall be able to predict earthquakes with sufficient reliability to give the prediction practical utility.

Summary.—Briefly summarizing what has gone before, I conclude that the chief primary function of a geological survey is geological research and that the spirit of investigation should be the same whether the work is undertaken to increase knowledge and to serve as the starting point for further attacks on the unknown, or is begun with a definite economic or practical result as its desired goal. Compromise and concession are inevitable but the necessity for making them should not and need not permit the real purpose of the organization to sink from sight. If the members of a scientific bureau can confidently feel that those charged with its direction make such concessions wisely with the higher purposes of the bureau really at heart their whole attitude towards their work will be entirely different from that into which they will fall if they become convinced that scientific ideals receive

only perfunctory regard and that the real allegiance is directed elsewhere.

What may be called the chief secondary function of a national geological survey is believed to be popular education in geology both for the benefit of the people and as providing the most enduring basis for the support of such an organization by a democracy. Such education should be conducted through every possible channel and in close cooperation with all of the educational institutions of the country. One of its objects should be the revival and encouragement of amateur geological observation and study. In this connection I heartily approve the present trend in the policy of the American Association for the Advancement of Science and believe that this great organization will fulfill its purpose and advance science much more effectively than in the past if it will leave to the various special scientific societies the holding of meetings devoted to the presentation of scientific papers, and devote itself to the popularization of science and to the encouragement of cooperation between different branches of science.

Personnel.—Finally a few words may be said concerning the relation between the personnel of a geological survey and the results obtained by the organization. If such a survey is to attract to its service men of first-rate ability and to hold these men after their development and experience has made them of the highest value, certain inducements must be offered. Salary is unfortunately the first of these that comes to mind under conditions that continually force the scientific men in government service to recognize painfully how inadequate at present is the stipend upon which he had existed before the war. It is all very well to insist that the scientific man does not work for money and should not trouble his thoughts with such an unworthy consideration. Nevertheless if he is to do the best of which he is capable he must be lifted above the grind of poverty, be able to give his children those educational advantages that he can so well appreciate, have opportunity for mental cultivation and feel his social position to be such that he can mingle without humiliation with his intellectual peers. If it is destructive to the scientific spirit to set up material gain as an object it may be equally blighting to scientific achievement to force the attention continually downward to the problem of meager existence. The normal scientific man usually has other human beings dependent upon him and the traditional spirit of self-sacrifice and the indifference to material reward that are commonly attributed to the true investigator may, when these members of his family are considered, come very close to selfishness.

However, salary, important as it is, is by no means the only determinant. If it is reasonably adequate most men who are animated by the spirit of science will find additional reward in their work itself if this is felt to be worthy of their best efforts. A man of first rate scientific ability, however, will not enter an organization in which consecutive application to a problem is thwarted, in which he is expected to turn to this or that comparatively unimportant task as political expediency may dictate or in which the general atmosphere is unfavorable to the initiation and prosecution of research problems of any magnitude. If a man of the type in mind finds himself in such an uncongenial environment he is likely to go elsewhere. The final effect upon the organization will be that its scientific staff will be mediocre or worse and it will become chiefly a statistical and engineering bureau from which leadership in geology will have departed.

If, on the other hand, a young geologist can feel that every possible opportunity and encouragement will be given to him in advancing the science of geology; that results on the whole will be considered more important than adherence to a schedule; that imagination and originality will be more highly valued than routine efficiency or mere executive capacity; that he will not be diverted to tasks for which, important as they may be, his training and inclination do not particularly fit him; that those directing the organization are interested in his develop-

ment and will give him all possible opportunity to demonstrate his power of growth; and that appreciation and material reward will be in proportion to his scientific achievement; he will then be capable of the best that is in him and will cheerfully contribute that best to the credit of the organization that he serves.

A national geological survey should hold recognized leadership in geology in the country to which it belongs and attainment of this proud position must obviously depend upon the quality of its geological personnel. With respect to personnel at least three conditions may be recognized—first, that in which the ablest geologists in the country are drawn to, and remain in service; second, that in which geologists perhaps of a somewhat lower grade as regards scientific promise are attracted to the service for a few years of training and then pass out to positions where the opportunities for research or for increased earnings are greater; and third, that in which able young men no longer look upon the geological survey as a desirable stepping stone to a future career. Who can doubt that it is the first condition that raises an organization to preeminence in science and the last that marks opportunities lost or unattained? Those responsible for the success of a geological survey, if they be wise, will watch the trend of the organization with reference to these conditions much as the mariner watches his barometer and, like him, if the indication be threatening, take action to forestall disaster.

F. L. RANSOME

DAVID S. PRATT

DR. DAVID S. PRATT, formerly assistant director of the Mellon Institute of Industrial Research of the University of Pittsburgh, died in St. Louis, Mo., on January 28, after a short illness from pneumonia. He was a member of the American Chemical Society and of the following fraternities: Phi Kappa Sigma, Sigma Xi, Alpha Chi Sigma, and Phi Lambda Upsilon.

Dr. David Shepard Pratt was born in Towanda, Pa., on September 20, 1885, the son of Charles Manville and Louise Hale (Woodford) Pratt. Following the completion of the collegiate course at Cornell University (A.B., 1908), he was appointed a fellow in chemistry at that institution (1909-1911) and in 1911 he received the degree of Ph.D. Dr. Pratt then joined the staff of the Bureau of Chemistry, Washington, D. C., as asistant chemist, but shortly afterward was selected as chief of the Organic Division of the Bureau of Science in Manila, P. I., where he spent three productive years in chemical research and as a member of the Pure Food and Drug Board. In 1914 he decided to return to the states and accepted a professorship of chemistry at the University of Pittsburgh. Dr. Pratt occupied that chair and the headship of the organic department of the school of chemistry at "Pitt" from 1914 to 1917, in which year he was made an assistant director of the Mellon Institute of Industrial Research. On January 1, 1920, Dr. Pratt resigned at the institute and was arranging to enter consulting chemical practise in St. Louis, Mo., at the time of his fatal illness.

Dr. Pratt was known principally for his published investigations on phthalic acid derivatives, but his reports of researches on various problems in the domain of tropical chemistry have also been of importance and he was a recognized authority on chemical Philippiniana. At the Mellon Institute Dr. Pratt enjoyed broad opportunities to apply, in the inquiries of the industrial fellowships under his supervision, his splendid equipment in chemistry and many results of technical importance were obtained through his suggestive aid. His profound knowledge of pure organic chemistry and his familiarity with research methodology were respected by his associates and played a prominent part in establishing the high success of the system in operation at the institute. His departure to enter professional practise was sincerely regretted by all of the members of the institution. He is survived by his wife, Fredonia Elizabeth (Johnson) Pratt, and an infant son, David Shepard Pratt, Jr.

W. A. H.

SCIENTIFIC EVENTS

THE BONAPARTE AND LOUTREUIL FOUNDATIONS OF THE PARIS ACADEMY OF SCIENCES

We learn from *Nature* that of the 72,500 francs placed at the disposal of the Academy by Prince Bonaparte, it proposed to allocate 30,000 francs as follows:

Five thousand francs to Charles Alluaud, traveling naturalist to the National Natural History Museum, for a geological and botanical expedition in the Moroccan Grand Atlas Chain.

Two thousand francs to A. Boutaric, for the construction of an apparatus for recording nocturnal radiation.

One thousand francs to Emile Brumpt, for continuing his work on parasitic hæmoglobinuria or piroplasmos of cattle.

Three thousand francs to E. Fauré-Fremiet, for undertaking a series of studies on histogenesis and certain surgical applications.

Three thousand francs to A. Guilliermond, for pursuing his researches on lower organisms and on mitochondria.

Three thousand francs to Joseph Martinet, for continuing his researches on the isatins capable of serving as raw material for the synthesis of indigo coloring matters.

Three thousand francs to A. Vavssières, for the continuation of his researches of the marine molluscs, family Cypræidæ.

Ten thousand francs to the Fédération française des Sociétés de Sciences naturelles, for the publication of a fauna of France.

The committee appointed to allocate the Loutreuil foundations recommended the following grants:

1. To establishments named by the founder:

Ten thousand francs to the National Museum of Natural History, for the reorganization of its library.

Seven thousand five hundred francs to the Paris Observatory, at the request of the Central Council of the Observatories, for purchasing an instrument.

2. Grants applied for direct:

Six thousand francs to the Société Géologique du Nord, to enable it to take up work interrupted by the war.

Ten thousand francs to l'Ecole des hautes études industrielles et commerciales ed Lille, for restoring the material of its chemical laboratory.

Twenty thousand francs to the Observatory of Ksara (near Beyrout). This laboratory was practically destroyed by the Turks and Germans. The grant is towards its restoration.

Eight thousand francs to Henri Deslandres, for the study of the radical movements of the solar vapors and the thickness of the gaseous atmosphere of the sun.

Seven thousand five hundred francs to Maurice Hamy, to carry out certain improvements in astronomical apparatus of precision.

Three thousand five hundred francs to Félix Boquet, for the publication of Kepler tables.

One thousand francs to G. Raymond, for the continuation of his actinometric experiments.

Ten thousand francs to Charles Marie, for exceptional expense connected with the publication of the "Tables annuelles de constants et données numériques de chimie, de physique et de technologie."

Ten thousand francs to the Fédération française des Sociétés de Sciences naturelles, for the publication of a French fauna.

Two thousand francs to P. Lesne, for his researches on the insects of peat-bogs.

Two thousand francs to A. Paillot, for his researches on the microbial diseases of insects.

Two thousand francs to Just Aumiot, for the methodical study of the varieties of potato.

Five thousand francs to Albert Peyron and Gabriel Petit, for the experimental study of cancer in the larger mammals.

Three thousand francs to Th. Nogier, for completing the installation of the radio-physiological laboratory of the Bacteriological Institute of Lyons.

AWARD OF THE NOBEL PRIZE TO PROFESSOR HABER

By order of the minister from Sweden the first secretary of the legation has made public the following statement correcting certain remarks that have appeared in the daily press concerning the award by the Swedish Academy of Science of a Nobel Prize for chemistry to Professor Fritz Haber of Berlin-Dahlen.

1. The invention for which the prize was awarded to Professor Haber was the synthesis of ammonia by direct way out of its constituent elements.

2. The report on which the award was made stated that the Haber method of producing

ammonia is cheaper than any other so far known, that the production of cheap nitric fertilizers is of a universal importance to the increase of food production, and that consequently the Haber invention was of the greatest value to the world at large.

3. The Haber method was invented and published several years before the outbreak of the great war. At the International Congress for Applied Chemistry held in the United States in 1912, it was described by Professor Bernthsen. The method was consequently known to all nations before the war and available to them to the same extent. It seems to have been put into practise in the United States.

4. Ammonia, the product of the Haber method, must be converted into nitric acid in order to give rise to explosives or to corrosive gases. As a matter of fact, the Haber plants in Germany were erected with a view to producing agricultural fertilizers.

5. As far as I know, no gas masks have ever been manufactured in Sweden. In all events, there existed in Sweden during the whole war an export prohibition on all sorts of war material. That prohibition has been rigorously upheld.

6. The Nobel Prizes are paid in one single post and not in monthly installments.

DYE SECTION OF THE AMERICAN CHEMICAL SOCIETY

THE second meeting of the Dye Section will be held in St. Louis, beginning Wednesday, April 14. At this meeting the committee on permanent organization will submit "By-Laws" for the consideration of the Section, the approval of which by the Section and by the Council, will be the necessary steps to the permanent organization of the Dye Chemists of the United States, as the Dye Division of the American Chemical Society.

The secretary asks all scientific workers in the field of dyes to present the results of their researches and experiences at these meetings of the dye chemists. Papers on the manufacture, properties or application of dyes, both of coal tar or natural origin, will be of timely interest. Any chemist having any such scientific information ready for presentation is asked to communicate at once with the secretary, giving subject and time for presentation.

As is usual, full details of the final program, time and place of meeting can be obtained by addressing Dr. C. L. Parsons, 1709 G. Street, N. W., Washington, D. C., or the undersigned.

R. NORRIS SHREVE,
Secretary

43 FIFTH AVENUE,
NEW YORK CITY

SCIENTIFIC NOTES AND NEWS

REAR ADMIRAL ROBERT EDWIN PEARY, retired, the distinguished arctic explorer, died at his home in Washington, on February 20, from pernicious anemia, aged sixty-three years.

PROFESSOR E. G. CONKLIN, of Princeton University, and Professor T. H. Morgan, of Columbia University, have been elected honorary members of the Belgian Society of Zoology and Malacology.

DR. JOHN R. SWANTON, of the Bureau of American Ethnology, and Dr. Truman Michelson, of the Bureau of American Ethnology and professor in George Washington University, have been elected corresponding members of the Société des Américanistes de Paris.

THE *Bulletin of the Johns Hopkins Hospital* for December contains a record by Dr. Thomas S. Cullen, of the work and writings of Dr. Henry Mills Hurd, Baltimore, who was the first superintendent of the hospital.

DR. JAMES HARRIS ROGERS, of Hyattsville, Maryland, has received from the Maryland Academy of Sciences, Baltimore, its inventor's medal for his work on "underground and sub-sea wireless."

IT is stated in *Nature* that the council of the Glass Research Association has appointed Mr. R. L. Frink, Lancaster, Ohio, director of research. The secretary of the association says: "Mr. Frink has a lifelong experience of the American glass trade and glass research, is well known to the foremost English glass

manufacturers, and his appointment is welcomed by the British glass industry."

Professor Frank G. Haughwout has been placed in charge of the work and investigation in protozoology and parasitology in the Bureau of Science, Manila. He has resigned his chair in the University of the Philippines, but will continue to lecture to the medical students.

Messrs. C. G. Derick, William Hoskins, F. A. Lidbury, A. D. Little, Charles L. Reese, and C. P. Townsend, have been appointed associate editors with Dr. John Johnston, editor of the *Technological Monographs* of the American Chemical Society. Messrs. G. N. Lewis, L. B. Mendel, Julius Stieglitz and A. A. Noyes, have been appointed associate editors with A. A. Noyes, editor of the *Scientific Monographs* of the society.

Professor H. A. Curtis, who has held the chair of organic chemistry at Northwestern University, has resigned to enter industrial work.

Mr. R. K. Brodie has been transferred from the position of industrial fellow at the Mellon Institute of Industrial Research to the chemical department of the chemical division of Proctor and Gamble Company, Ivorydale, Ohio.

Dr. George Heyl has become vice-president and technical director of the Heyl Laboratories, Inc., New York City.

The directors of the Fenger Memorial Association have awarded Dr. Harry Culver a grant to aid in the study of certain urinary infections.

Dr. Edwin Deller, secretary of the Brown Animal Sanatory Institution, University of London, has been appointed assistant secretary to the Royal Society to succeed Mr. R. W. F. Harrison, who, owing to the state of his health, has resigned the office, which he has held for twenty-four years.

The following awards have been made by the council of the British Institution of Mining and Metallurgy: (1) Gold medal of the institution to Mr. H. Livingstone Sulman, in recognition of his contributions to metallurgical science, with special reference to his work in the development of flotation and its application to the recovery of minerals. (2) "The Consolidated Gold Fields of South Africa, Ltd." gold medal to Mr. William Henry Goodchild, for his papers on "The Economic Geology of the Insizwa Range" and "The Genesis of Igneous Ore Deposits." (3) "The Consolidated Gold Fields of South Africa, Ltd." premium of forty guineas to Dr. Edward Thomas Mellor, for his paper on "The Conglomerates of the Witwatersrand."

At a recent meeting of the advisory committee of the American Chemical Society it was voted to recommend to the Board of Directors that a sum not to exceed $1,000 for traveling expenses be placed at the disposal of Professor W. A. Noyes, the president of the society, for the year 1920, for the purpose of visiting local sections of the society, such trips to be made by arrangement with the president but only on condition that the section or sections visited pay one half such expenses. It was suggested that local sections so far as possible arrange with the president or among themselves for joint meetings or continuous routing.

It is noted in *Nature* that December 31, marked the bicentenary of the death of John Flamsteed, first astronomer royal of England, and the rector of the parish of Burstow, Surrey, where he is buried. Flamsteed was born four years after Newton. Though prevented by illness from attending a university, he was devoted to mathematical studies, and in 1671 sent a paper to the Royal Society. Three years later he published his "Ephemerides," a copy of which, being presented to Charles II. by Sir Jonas Moore, led to Flamsteed being appointed on March 4, 1675, "our astronomical observer" at a salary of £100 per annum, his duty being "forthwith to apply himself with the most exact care and diligence to the rectifying the tables of the motions of the heavens and the places of the fixed stars, so as to find out the so much desired longitude of places for the perfecting the art of navigation." The observatory at Greenwich, constructed partly of brick from

old Tilbury Fort and of timber and lead from the Tower of London, was designed by Wren and built at a cost of £520, the money being derived from the sale of spoilt gunpowder.

A RESEARCH MEDICAL SOCIETY was organized recently at the Loyola University School of Medicine. The following officers were elected for the academic year 1919–20: *President*, R. M. Strong; *Vice-president*, F. M. Phifer; *Secretary*, A. B. Dawson; *Treasurer*, E. S. Maxwell; *Members of the council*, S. A. Matthews, George W. Wilson, and F. B. Lusk.

PROFESSOR FREDERIC S. LEE, of Columbia University, lectured recently on "Problems of industrial physiology" before the Royal Canadian Institute, Toronto, and the Johns Hopkins School of Hygiene and Public Health.

PROFESSOR H. N. HOLMES, head of the chemistry department in Oberlin College, has recently lectured at Case School of Applied Science, Cleveland, and before the Cincinnati section of the American Chemical Society on "The industrial applications of colloid chemistry."

AN address on the "Theories regarding the formation of phosphate deposits" was given at the Ohio Agricultural Experiment Station on February 16, by Dr. Walter H. Bucher, of the department of geology of the University of Cincinnati.

PROFESSOR H. SHIPLEY FRY, director of chemical laboratories, University of Cincinnati, lectured on "The electronic conception of valence and the constitution of benzene" before a joint meeting of the Leigh Chemical Society and the Lexington, Kentucky, section of the American Chemical Society at Georgetown College on February 13.

AT a meeting of the Faculty Club of the University of Mississippi on February 2, 1920, Dr. Hiram Byrd, director of the department of hygiene, delivered a lecture on "Rattlesnakes."

THE president of the Royal College of Physicians, London, has appointed Dr. F. W. Andrews to be Harveian orator, and Dr. R. C. Wall to be Bradshaw lecturer for this year. The council has appointed Dr. Martin Flack to be Milroy lecturer for 1921. The Oliver-Sharpey prize for 1920 has been awarded to Professor Emil Roux, of the Pasteur Institute, Paris.

UNIVERSITY AND EDUCATIONAL NEWS

MR. J. OGDEN ARMOUR has made a further gift of six million dollars to the Armour Institute of Chicago. A new site for the school has been purchased at the cost of one million dollars, and five million dollars will be expended on buildings.

AT YALE UNIVERSITY, Dr. W. H. Sheldon, of Dartmouth College, has been appointed professor of philosophy. Dr. W. R. Longley, has been promoted to a full professorship of mathematics.

DR. E. F. HOPKINS, associate plant pathologist at the Alabama Polytechnic Institute and Experiment Station, has been appointed plant pathologist and assistant professor of botany at the University of Missouri. Dr. Hopkins will begin his work on April 1.

DR. C. L. METCALF has been promoted to be professor of entomology in the Ohio State University.

DR. H. G. FITZGERALD has received an appointment as profesor of hygiene at the University of Toronto, to succeed Dr. J. A. Amyst, who has been appointed deputy minister of health in the Federal Department of Health, Ottawa.

DISCUSSION AND CORRESPONDENCE

A PROPOSED METHOD FOR CARRYING TRIANGULATION ACROSS WIDE GAPS

So far as is known, the possibility of extending an arc of triangulation across straits or arms of the sea has been limited in the past to cases in which one shore is visible from the other, or at most where the masts of a vessel anchored in mid-channel are visible from both shores. It has occurred to us that much wider

gaps may be bridged by the use of lights raised to a high altitude by aircraft or pilot balloons. For example, the distance between the Florida reefs and Cuba is about 90 miles, and the shores not high enough to permit of intervisibility. From an aircraft at a height of 5,000 feet or more above the middle of the straits both sides would be readily visible in clear weather. Suppose now that a series of stations along the Florida coast had been connected in the usual manner with the triangulation net of the United States, and that another series of points on the Cuban coast had been connected with a triangulation covering the island. A light carried by a dirigible or pilot balloon above the middle of the straits could be observed from two or more stations on each shore, and its position accurately fixed with respect to both systems of triangulation. If two or three such aerial points at distances of 30 or 40 miles along the axis of the channel have been tied in this fashion to both triangulations, a strong connection will have been established between them.

It is obviously necessary either that the "aerial point" should remain fixed while observations are being made on it, or that the observations at the different stations should all be exactly synchronized. The first is impossible, but the second alternative can easily be realized by using practically instantaneous flashes as signals and observing them photographically. A quantity of flash powder sufficient to produce a signal which could be photographed from 50 miles distance could probably be carried by an unmanned balloon of moderate size and cost, or failing this, a series of such charges attached to parachutes and ignited by time fuses could be dropped from a dirigible.

The photographic records would preferably be made with lenses of moderately large aperture and long focus, such as are used for astronomical chart work, which give a field of good definition several degrees in diameter. If the observation stations are several miles back from the shore line, a series of reference lights can be established on the shore, and their azimuths accurately determined in advance. The photographs will then show these lights as well as the distant flashes, and the angular elevation and azimuth of the latter can be determined directly from the plates themselves, in exactly the same manner in which astronomers determine the position of a planet with reference to neighboring stars. A number of successive flashes could be recorded on one plate, provided they were so spaced as to avoid confusion, with marked economy both in flying time and computation. Clear weather would be necessary, but not more so than in the case of ordinary methods of observation.

With regard to accuracy, it is well known that this standard method of determining angular position by the measurement of photographic plates is capable of very high precision. For example, at the Allegheny Observatory with a 4-inch objective the probable error of a resulting angular coordinate derived from two plates was found to be $\pm 0.2''$. The apparent angular diameter of the flash as seen from a distance of 50 miles would be roughly $1''$ for each foot of its actual linear diameter. As settings may be made on the center of a photographic image within 1 per cent. or 2 per cent. of its diameter, the azimuth of the flash should be obtainable with sufficient accuracy for purposes of primary triangulation, particularly as the mean position determined from the several successive flashes on one plate should be regarded as the real unit of observation. Irregularities in refraction are likely to be less serious than in the case of rays which pass closer to the earth's surface.

This method might also be advantageous in crossing wide areas of swamp or jungle. The limiting distance over which it is available can be determined only by actual experiment, but it is likely to exceed 100 miles, which would be great enough to permit the extension of continuous triangulation along the whole chain of the West Indies. The theoretical distance of the horizon from an altitude of 20,000 feet is over 170 miles, so that if the difficulties involved in producing flashes photographically observable at this great distance

can be surmounted, it may ultimately be possible to connect Australia with the East Indies and so with Asia.

H. L. COOKE,
HENRY NORRIS RUSSELL
PRINCETON UNIVERSITY

TWO NEW BASE MAPS OF THE UNITED STATES

AN outline base map of the United States on the Lambert Zenithal equal area projection, scale 1–7,500,000, dimensions 19¾ inches by 25¾ inches, price 15 cents, has just been issued by the Coast and Geodetic Survey.

The map covers the whole of the United States, including the northern part of Mexico. Only state names and boundaries, principal rivers, capitals, and largest cities are shown, the chief object being to furnish a base map for political, census, or statistical purposes on a projection in which the property of equivalence of area is one of the essential features. It is the first publication of a projection of this type by the Coast and Geodetic Survey.

The two errors, to one or both of which all map projections are liable, are change of area and distortion, as applying to portions of the earth's surface. Errors of distortion imply deviation from right shape in the graticules or network of meridians and parallels of the map, involving deformation of angles, curvature of meridians, changes of scale, and errors of distance, bearings, or area.

In the mercator projection as well as in the Lambert Conformal Conic projection, the changes in scale and area can not truly be considered as distortion or as error. A mere alteration of size in the same ratio in all directions is not considered distortion or error. These projections being conformal, both scale and area are correct in any restricted locality when referred to the scale of that locality, but as the scale varies in latitude from point to point large areas are not correctly represented.

In the Lambert Zenithal projection the zenith of the central point of the surface to be represented appears as pole in the center of the map; the azimuth of any point within the surface, as seen from the central point, is the same as that for the corresponding points of the map; and from the same central point, in all directions, equal great circle distances to points on the earth are represented by equal linear distances on the map. The amount of scale error, as we depart from the center of the map radially, increases (scale becoming smaller), while in a direction at right angles thereto the scale is by the same amount too great.

For a distance from the assumed center of the map equal to 22 degrees of arc of a great circle, an extent embracing the whole of the United States, the maximum scale error is but one and seven eighths per cent. The amount of this error is less than one third of the scale error in a polyconic projection of the same area, while the direction errors (errors of angles and azimuths) are likewise considerably less than in the latter projection.

An outline base map of the United States on the Lambert Conformal Conic projection, scale, 1–5,000,000, dimensions, 25 by 39 inches, price, 25 cents, has also been issued by the Coast and Geodetic Survey. This map is similar to the one on the Zenithal Equal Area projection in general treatment. It is larger in scale, however, but embraces a lesser extent of latitude, being limited to the area of the United States, whereas the zenithal equal area map includes the greater portion of Mexico.

The map is of special interest from the fact that it is based on the same system of projection as that which was employed by the allied forces in the military operations in France.

The term *conformal* has been defined as follows: If at any point the scale along the meridian and the parallel is the same (not correct, but the same in the two directions) and the parallels and meridians of the map are at right angles to one another, then the shape of any very small area on the map is the same as the shape of the corresponding small area upon the earth. The projection is then called orthomorphic (right shape).

The value of this new outline map can best be realized when it is stated that throughout

the larger and most important part of the United States, that is, between latitudes 30½° and 47½°, the maximum scale error is only one half of one per cent. Only in southernmost Florida and Texas does this projection attain its maximum scale error of 2⅓ per cent. This implies, however, an error in the areas at these extreme parts equal to the square of the linear distortion, or an error of 5⅓ per cent.

While this error in area may be accounted for by methods already described, the Zenithal projection on the other hand is free from this inconvenience.

The choice then between the Lambert zenithal and the Lambert conformal for a base map of the United States, disregarding scale and direction errors which are conveniently small in both projections, rests largely upon the choice of *equal area* as represented by the Zenithal and *conformality* as represented by the Conformal Conic projection—the former property appealing directly to the practical use of the map, the latter property being one of mathematical refinement and symmetry with definite scale factors available, the projection having two parallels of latitude of true scale, the advantages of straight meridians as an element of prime importance, and the possibilities of indefinite east and west extension without increase of scale error.

SPECIAL ARTICLES

SUBSTITUTES FOR PHENOLPHTHALEIN AND METHYL ORANGE IN THE TITRATION OF FIXED AND HALF-BOUND CO_2[1]

During the past year the writer has had occasion to make a great many determinations of sodium carbonate in the presence of the hydrate by the double titration method with phenolphthalein and methyl orange as indicators. The end point with methyl orange was not satisfactory. A number of new indicators were tried with the result that two were found which may be used as substitutes for phenolphthalein and methyl orange. An added advantage of these two indicators[2] is that both have the same color changes. Six drops of one indicator in 75 c.c. of solution gives a fairly deep blue in the presence of sodium hydrate and carbonate and on titration with hydrochloric acid retains this color until the hydrate is all neutralized and the carbonate converted into bicarbonate when it changes at the neutral point to a muddy green and then with a slight excess of acid to a lemon yellow. The addition of three drops of the second indicator will now change the solution to a deep blue, which continues until the bicarbonate has all been destroyed, when the solution shows the same intermediate change as before and becomes a lemon yellow again when a slight excess of acid is present.

These indicators are among the nine recommended by Clark & Lubs[3] for the colorimetric determination of hydrogen ion concentration. The first indicator, thymol blue (thymol sulfon phthalein) is prepared by introducing 1 decigram of the substance into a Florence flask and then adding 4.3 c.c. of $n/20$ sodium hydroxid. The solution is best heated by introducing the flask into hot water and agitating until the indicator is all dissolved. When solution is complete, the volume is made up to 250 c.c. with distilled water.

The substitute for methyl orange is brom phenol blue (tetra bromo phenol sulfon phthalein). This indicator is made up in the same way except that 1 decigram requires only 3.0 c.c. of $n/20$ sodium hydroxide.

F. M. Scales
U. S. Department of Agriculture

[1] Published by permission of the Secretary of Agriculture.

[2] These indicators may be obtained from Hynson, Westcott & Dunning, of Baltimore, Maryland.

[3] Clark, Wm. Mansfield, and Lubs, Herbert A., *Jour. of Bacteriology*, Vol. II., Nos. 1, 2 and 3.

THE AMERICAN SOCIETY OF ZOOLOGISTS

The American Society of Zoologists held its seventeenth annual meeting in conjunction with Section F of the American Association for the Advancement of Science and the Ecological Society of America, December 29, 30 and 31, in the Soldan High School building, St. Louis, Missouri. President C. M. Child presided throughout the

meetings. The other officers for the year were: *Vice-president,* H. H. Wilder; *Secretary-Treasurer,* W. C. Allee; *Executive Committee,* L. J. Cole, R. P. Bigelow, H V. Wilson, M. M. Metcalf, George Lefevre; *Member Council A. A. A. S., C. P.* Sigerfoos; *Local Representative,* Caswell Grave.

ELECTION OF MEMBERS

At the business meeting the Executive Committee recommended the following persons for election to membership in the society: George Delwin Allen, Albert W. Bellamy, William Charles Boeck, Calvin O. Esterly, Frank Blair Hanson, Charles Eugene Johnson, Ernest Everett Just, James Ernest Kindred, Mrs. Ruth Stocking Lynch, Thomas Byrd Magath, James Watt Mayor, Dwight Elmer Minnich, Carl R. Moore, Thurlow Chase Nelson, Nadine Nowlin, Charles H. O. Donoghue, Albert Duncan Robertson, Francis Metcalf Root, Elizabeth Anita Smith, Dayton Stoner, Gertrude Marean White, Sadao Yoshida. All were duly elected.

The treasurer's report showed a balance of $809.59, an increase for the year of $63.21.

ADVISORY BOARD

At the request of Frank R. Lillie, chairman of the committee on cooperation and coordination of the Division of Biology and Agriculture of the National Research Council, the executive committee approved, and the society passed the following resolution:

Resolved: That there be established a permanent committee to be called the advisory board of the American Society of Zoologists, consisting of eight members appointed by the executive committee, two each for periods of one, two, three and four years; and thereafter two each year for a four-year term. The chairman of the board shall be elected annually by the board.

The duties of the board shall be:

1. To represent the American Society of Zoologists before the National Research Council.

2. To correlate the various research agencies of the country in zoology; including various government bodies, both national and state, museums, research establishments and universities.

3. To promote international relations in zoology.

4. To take up other problems for the promotion of research in zoology, subject to the approval of The Executive Committee.

President Child announced the appointment by the executive committee of the following advisory board: F. R. Lillie, Wm. E. Castle, C. C. Nutting, G. N. Calkins, J. T. Patterson, M. M. Metcalf, V. E. Shelford, Robert Chambers, Jr.

THE JOURNAL OF MORPHOLOGY

Owing to the request of Professor J. S. Kingsley to be relieved of the editorial management of the *Journal of Morphology* at a date in 1920 not yet definitely fixed, The Wistar Institute through M. J. Greenman, its director, approached the American Society of Zoologists, proposing that the society assume responsibility for the scientific policy and the election of the editorial board of the *Journal of Morphology,* subject to the approval of the advisory board of The Wistar Institute and full financial responsibility for the *Journal* to be kept by The Wistar Institute.

Mr. Greenman further proposed that the society appoint a small special committee on publication which should meet with the advisory board of The Wistar Institute in Philadelphia at certain of its regular meetings held in April to discuss journal affairs in general, and those of the *Journal of Morphology* in particular.

Whenever the committee was called to attend a meeting in Philadelphia all expenses of travel and entertainment incident thereto are to be paid by The Wistar Institute.

After discussion it was voted to approve the general proposition of assuming responsibility for the scientific policy, and the appointment of the editorial board of the *Journal of Morphology;* and the Executive Committee was instructed to appoint a committee on publication whose duties would be:

1. To initiate a scientific policy concerning the *Journal of Morphology.*

2. To nominate an editorial board.

3. To consult with the advisory board of The Wistar Institute concerning both the proposed policy and the editorial nominations.

4. To refer the recommendations for final decision to the executive committee in 1920, and thereafter through the executive committee to the society at its annual meeting.

M. M. Metcalf, Caswell Grave and W. E. Castle have been duly appointed members of the Committee on Publication.

NEW BY-LAW

The following new By-law was adopted:

By-Laws (Add) No. 4

The National Research Council allows the society three representatives on the Division of Biology and Agriculture. Of these three representatives, one shall be elected each year to serve three years. The method of election shall be the same as that used in the election of the officers of the society.

PROPOSED CHANGE IN CONSTITUTION

Although final action could not be taken at this meeting, the following proposed amendment to the Constitution was read:

Article II. (Add) Section 4

Honorary fellows, regardless of membership in the society, may be elected upon unanimous recommendation of the executive committee, by a majority vote of the members present at any meeting of the society. The number of honorary fellows shall be limited to ten and not more than one shall be elected on any one meeting of the society. Honorary fellowships does not involve the payment of dues nor does it confer the right to vote.

After discussion, it was voted that any amendment to the constitution shall not contemplate the elevation of members of the society, and that honorary membership shall be limited to members of foreign societies.

RESOLUTIONS

The resolution committee, consisting of Caswell Grave, Bennet M. Allen and Chancey Juday, reported the following resolutions, which were adopted by standing vote, and ordered spread on the records:

William Erskine Kellicott
1878–1919

Mindful of the great loss sustained by the American Society of Zoologists and zoological science in the death of William Erskine Kellicott, the members of the society find comfort and satisfaction in recalling the mature and substantial character of his scientific contributions, the unusual abilities he displayed as a teacher of zoology, and above all the pleasing personality of their coworker and friend.

The society, therefore, desires to record this minute in recognition of his services to zoological science and to mankind.

George L. Kite
1882–1919

During the brief period of his labors, George L. Kite showed special aptitude, and an adequate preparation for the investigation of the difficult problems which lie in the field where zoology, chemistry and physics meet. His loss is only partially repaired by the inspiration which the methods he developed and the results he attained are affording to the workers who have taken up the problems he relinquished.

The American Society of Zoologists places this minute on record, thereby expressing its regret at the early loss of this promising member.

ELECTION OF OFFICERS

The nominating committee composed of S. O. Mast, V. E. Shelford and B. M. Allen, reported the following nominations:

President, Gilman A. Drew.

Vice-president, Caswell Grave.

Member Executive Committee to serve five years, C. M. Child.

Member of Division of Biology and Agriculture, National Research Council, to serve three years, F. R. Lillie.

Nominations from the floor were called for but none was suggested, and the officers as presented by the Nominating Committee were duly elected.

On nomination of the executive committee, C. C. Nutting was elected member of the council of the American Association for the Advancement of Science in place of C. P. Sigerfoos, resigned.

SESSIONS FOR THE PRESENTATION AND DISCUSSION OF PAPERS

At the meetings of the society for the presentation and discussion of papers a total of 42 papers were presented in full, and 28 were read by title. Seventeen of the papers were followed by discussion.

List of Titles

The titles have been arranged by the secretary of the zoologists according to the rules of the society, in the order of their arrival.

Papers marked with an asterisk were read by title.

Embryology

**The individuality of the germ-nuclei during the cleavage of the egg of Cryptobranchus alleghe-niensis:* Bertram G. Smith, Michigan State Normal College.

**A sex intergrade pig which resembles a free-martin:* Will Scott, Indiana University.

Retention of dead fetuses in utero and its bearing on the problems of superfetation and superfecundation: Albert Kuntz, St. Louis University, School of Medicine.

**An explanation of the early development of the peripheral nervous system in the vertebrate embryo:* H. H. Lane, University of Oklahoma.

The thyroid and parathyroid glands of Bufo tadpoles deprived of the pituitary glands: Bennet M. Allen, University of Kansas.

The influence of thyroid extirpation upon the various organs of Bufo larvæ: Bennet M. Allen, University of Kansas.

Stages in the development of the thymus, parathyroid and ultimobranchial bodies in turtles: Charles Eugene Johnson, department of zoology, University of Kansas.

The results of the extirpation of the thyroid and of the pituitary anlagen on the suprarenal tissue in Rana pipiens: ALICE L. BROWN, Kansas State Agricultural College. (Introduced by B. M. Allen.)

Cytology

**The effect of hypotonic and hypertonic solutions on fibroblasts of the embryonic chick heart in vitro:* M. J. HOGUE, school of hygiene and public health, Johns Hopkins University.

**Coelenterates and the evolution of germ cells:* GEORGE T. HARGITT, Syracuse University.

Cytological criteria for the determination of Amœbic cysts in man: S. I. KORNHAUSER, Denison University.

The spermatogenesis of Anolis carolinensis: THEOPHILUS S. PAINTER, University of Texas.

The presence of a longitudinal split in chromosomes prior to their union in parasynapsis: W. R. B. ROBERTSON, University of Kansas.

Chromosome studies in Tettigidæ. II. Chromosomes of BB, CC and the hybrid BC in the genus Paratettix: MARY T. HARMAN, zoology department, Kansas State Agricultural College.

Parasitology

Notes on the life-cycle of two species of Acanthocephala from fresh-water fishes: H. J. VAN CLEAVE, University of Illinois.

On the life-history of the gape-worm (Synagamus trachealis): B. H. RANSOM, U. S. Bureau of Animal Industry, Washington, D. C.

A new bladder fluke from the frog: JOHN E. GUBERLET, Oklahoma Agricultural Experiment Station, Stillwater, Okla.

Studies on the development of Ascarida perspicillum, parasitic in fowls: JAMES E. ACKERT, Kansas State Agricultural College.

**New data bearing on the life-history of Sarcocystis tenella:* JOHN W. SCOTT, University of Wyoming.

Contributions to the life-history of Gordius robustus Leidy: H. G. MAY, Mississippi College.

Leucochloridium problematicum n. sp.: THOMAS BYRD MAGATH, Mayo Clinic. (Lantern.)

Two new genera of Acanthocephala from Venezuelan fishes: H. J. VAN CLEAVE, University of Illinois.

**Note on the behavior of embryos of the fringed tapeworm:* JOHN W. SCOTT, University of Wyoming.

Contributions to the life-history of Paragordius varius (Leidy): H. G. MAY, Mississippi College.

Genetics

Selection for increased and decreased bristle number in the mutant strain "reduced": F. PAYNE, Indiana University.

The mutational series, full to bar to ultra bar, in Drosophila: CHARLES ZELENY, University of Illinois.

Variation in the percentage of crossovers and selection: J. A. DETLEFSEN and E. ROBERTS, College of Agriculture, University of Illinois.

Inheritance of color in the domestic turkey: W. R. B. ROBERTSON, University of Kansas.

Heredity of orange eye color: F. PAYNE and MARGARET DENNY, Indiana University.

The tabulation of factorial values for eye-facet number in the bar races of Drosophila: CHARLES ZELENY, University of Illinois.

Linkage of genetic factors in mice: J. A. DETLEFSEN and E. ROBERTS, College of Agriculture, University of Illinois.

Forty-two generations of selection for high and low facet number in the white bar-eyed race of Drosophila: CHARLES ZELENY, University of Illinois.

On the inheritance of congenital cataract in dairy cattle: J. A. DETLEFSEN and W. W. YAPP, College of Agriculture University of Illinois.

Ecology and General Physiology

Observations on the habits of larval colonies of Pectinatella: STEPHEN R. WILLIAMS, Miami University.

Animal aggregations: W. C. ALLEE, Lake Forest College.

Behavior of the larvæ of Corethra punctipennis Say: CHAUNCEY JUDAY, Wisconsin Natural History Survey.

**Studies on chitons:* W. J. CROZIER, Hull Zoological Laboratory, University of Chicago.

**On the natural history of Onchidium:* LESLIE B. AREY and W. J. CROZIER, Northwestern University, University of Chicago.

**The olfactory sense of Orthoptera:* N. E. McINDOO, Bureau of Entomology, Washington, D. C.

On a new principle underlying movement in organisms: A. A. SCHAEFFER, University of Tennessee.

The relation of the concentration of oxygen to the rate of respiratory metabolism in Planaria: E. J. LUND, Laboratory of General Physiology, University of Minnesota.

**Experimental studies on the cerebral cortex and*

corpus striatum of the pigeon: F. T. ROGERS, Marquette School of Medicine.

**Photic orientation in the drone-fly, Eristalis tenax:* S. O. MAST, Johns Hopkins University.

**Behavior of a tunicate larva:* W. J. CROZIER, The University of Chicago.

**Vision in the seventeen-year locust, Cicada septendecim:* S. O. MAST, Johns Hopkins University.

**Periodicity in the photic responses of the euglenoid, Septocinclis texta, and its bearing on reversion in the sense of orientation:* S. O. MAST, Johns Hopkins University.

**Adaptation to light in Euglena variabilis (?) and its bearing on reversion in orientation:* S. O. MAST, Johns Hopkins University.

**The maze-behavior of white rats in the second generation after alcoholic treatment:* E. C. MACDOWELL and E. M. VICARI, Carnegie Institution of Washington.

**The relation of modifiability of behavior and metabolism in land isopods:* C. H. ABBOTT, Massachusetts Agricultural College. (From the Osborn Zoological Laboratory, Yale University; introduced by Henry Laurens.)

The rate of carbon dioxide production by pieces of Planaria, in relation to the theory of axial gradients: GEORGE DELWIN ALLEN, University of Minnesota. (Introduced by E. J. Lund.)

Evolution

**Irreversible differentiation and orthogenesis:* C. JUDSON HERRICK, The University of Chicago.

**An analysis of the sexual modifications of an appendage in sex-intergrade Daphnia longispina:* A. M. BANTA and MARY GOVER, Station for Experimental Evolution.

Comparative Anatomy

**The Urodele vomer:* INEZ WHIPPLE WILDER, Smith College.

**The origin, function and fate of the test-vesicles of Amaroucium constellatum:* CASWELL GRAVE, Washington University. (Lantern.)

Respiratory organs of Ucides caudatus, a West Indian land crab: C. C. NUTTING, University of Iowa. (Lantern.)

**The homologies and development of the papal organ of male spiders:* W. M. BARROWS, Ohio State University.

**Morphology of the enteron of the periodical cicada, Tibicen septendecim Linn:* CHARLES W. HARGITT and L. M. HICKERNELL, Syracuse University.

**Sexual dimorphism in Nemertians:* W. R. COE, Yale University.

The columella auris of the Reptilia: EDWARD L. RICE, Ohio Wesleyan University.

**The spiracular organ of elasmobranch, ganoid and dipnoan fishes:* H. W. NORRIS and SALLY P. HUGHES, Grinnell College.

Invitation Program

Faunal areas on the Pacific slope of South America: C. H. EIGENMANN, University of Indiana.

Discussion led by C. C. Nutting, University of Iowa.

Polyembryony and sex: J. T. PATTERSON, Texas University.

Discussion led by S. I. Kornhauser, Denison University.

Physiological life histories of terrestrial animals: V. E. SHELFORD, Illinois Natural History Survey and the University of Illinois.

Discussion led by Thomas Headlee, New Jersey Agricultural Experiment Station.

The work of the National Research Council in relation to zoology: C. E. MCCLUNG, chairman, Division of Biology and Agriculture, National Research Council.

Papers Contributed by The Ecological Society of America

Hydrogen ion concentration in the different stages of pond succession: V. E. SHELFORD, Illinois Natural History Survey.

Distribution of life on a river bottom: A. D. HOWARD, U. S. Bureau of Fisheries.

Changes observed in river fauna above Keokuk Dam: A. D. HOWARD, U. S. Bureau of Fisheries.

Ecological succession of insects in stored food products: ROYAL N. CHAPMAN, University of Minnesota.

Papers following the Zoology Dinner

The message of the biologist, vice-presidential address for Section F: WILLIAM PATTEN, Dartmouth College.

Motion pictures of the Barbadoes-Antigua Expedition: C. C. NUTTING, University of Iowa.

EXHIBITS

Slides of stained cysts of the intestinal amœbas and flagellates of man: S. I. KORNHAUSER, Denison University.

Wire models of paths of oyster larvæ, dero, etc.: A. A. SCHAEFFER, University of Tennessee.

The embryonic columella auria of the lizard, *Eumeces:* EDWARD L. RICE, Ohio Wesleyan University.

Phenotypes in coat colors in mice: J. A. DETLEFSEN and ELMER ROBERTS, Laboratory of Genetics, College of Agriculture, University of Illinois.

Demonstration of synapsis stages in the chromosomes of grouse locusts and other grasshoppers: W. R. B. ROBERTSON, University of Kansas.

Feathers illustrating the inheritance of color in varieties of the domestic turkey: W. R. B. ROBERTSON, University of Kansas.

The development of the asexual larvæ in *Paracopidosomopsis:* J. T. PATTERSON, University of Texas.

Full proceedings of the meeting together with abstracts of papers and a list of members and their addresses will be found in the *Anatomical Record* for January, 1920.

W. C. ALLEE,
Secretary

THE MINERALOGICAL SOCIETY OF AMERICA

AT a meeting held in the quarters of the Department of Mineralogy at Harvard University on December 30 a group of 28 mineralogists from all sections of the United States, including representatives from Canada, organized a new society to be known as the Mineralogical Society of America. This action was the outcome of a movement started at the Albany meeting of the Geological Society of America in 1916 for the bringing together into a permanent organization of workers in science whose interest lay largely or wholly in mineralogy, crystallography or those allied sciences which include physical crystallography and mineral synthesis.

A provisional Constitution and By-Laws were adopted which defined the object of the society as the advancement of mineralogy, crystallography and the allied sciences and provided for several forms of membership, as follows:

1. *Fellows,* who are to be nominated by the council, must qualify for eligibility by having produced some published results of research in mineralogy, crystallography or the allied sciences. Fellows are eligible for office in the society and may vote upon amendments to the Constitution.

2. *Members,* who comprise persons who are engaged in or interested in mineralogy, crystallography or the allied sciences, but who are not qualified for fellowship. Membership carries with it the right to vote upon all matters except the amendment of the Constitution, but members are not eligible for office.

The Constitution also provides for *Patrons,* who shall have conferred material favors upon the society and *Correspondents,* or residents outside of North America who are sufficiently distinguished in the subjects for which the society stands to warrant their receiving this recognition.

Because it was recognized that the comparatively small attendance at the meeting did not adequately represent the probable initial membership of the society, the lists of charter fellows and members have been kept open until a later meeting of the society.

It is expected that the general membership of the society at the close of 1920 will number some 350 to 400 fellows and members.

It was decided to publish a journal devoted to mineralogy, crystallography and the allied sciences, which shall be the official organ of the society, and which the general membership of the society shall be entitled to receive. The present plan is to enlarge the *American Mineralogist* to include research papers and abstracts, but at the same time to retain the valuable features of this publication which has become recognized as of permanent interest to such collectors and amateurs who are eligible to membership but not fellowship. The council of the society has under consideration the question of affiliation with the Geological Society of America.

The provisional officers of the new society which were elected at the December meeting are: President, E. H. Kraus, of the University of Michigan; Vice-president, T. L. Walker, of the University of Toronto; Secretary, H. P. Whitlock, of the American Museum of Natural History; Treasurer, A. B. Peck, of the Bureau of Standards, Washington;

Editor, E. T. Wherry, of the Bureau of Chemistry, Washington; and Councilors, A. S. Eakle, of the University of California (1 year); F. R. Van Horn, of the Case School of Applied Science, Cleveland (2 years); F. E. Wright, of the Carnegie Geophysical Laboratory, Washington (3 years); and A. H. Phillips, of Princeton University (4 years).

The formation of a society whose object is to promote and foster the mineralogical sciences comes at a time when there is a distinct need in this country for such a body. The growing importance of this field of research, already felt to a marked degree in the period preceding the war, has now with the necessary curtailing of scientific activity in Europe, assumed scope and size. It is acknowledged by observers of the trend of events that scientific prestige has come to abide in America rather than in the countries of the Old World. No more keenly is this tendency sensed than in those industries which are demanding trained workers in crystallography and physical mineralogy for their research laboratories. If then, science is to keep pace with industry in this period of reconstruction and if our universities and technical schools are to supply to the increasing stream of students coming to us from abroad, the high standard of scientific education which has come to be demanded of us, it is eminently right and fitting that such specialized bodies as the Mineralogical Society of America should be formed and fostered.

Herbert P. Whitlock,
Secretary

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION A—MATHEMATICS AND ASTRONOMY

Inasmuch as the American Mathematical Society and the Mathematical Association of America both had meetings at St. Louis during the period of the meeting of the American Association, only one formal meeting was held of Section A. At this meeting, which was a joint meeting with the American Mathematical Society, the following papers were given:

Recent progress in dynamics: Professor G. D. Birkhoff, retiring vice-president of Section A.

Some recent developments in the calculus of variations: Professor G. A. Bliss, retiring chairman of the Chicago Section of the American Mathematical Society.

A suggestion for the utilization of atmospheric molecular energy: Mr. H. H. Platt.

What has been heretofore Section A has been divided into two sections, "A"—Mathematics, and "B"—Astronomy. The officers of Section A are as follows:

Vice-president—D. R. Curtiss, Northwestern University.

Secretary—Wm. H. Roever, Washington University.

Members of Sectional Committee—5 years, Dunham Jackson, University of Minnesota; 4 years, A. D. Pitchard, Western Reserve University; 3 years, G. A. Bliss, University of Chicago; 2 years, James Page, University of Virginia; 1 year, H. L. Rietz, University of Iowa.

Member of the Council—G. A. Miller, University of Illinois.

Member of General Committee—E. V. Huntington, Harvard University.

The officers of Section B are:

Vice-president—Joel Stebbins, University of Illinois.

Secretary—F. R. Moulton, University of Chicago.

Members of the Sectional Committee—5 years, Philip Fox, Northwestern University; 4 years, H. N. Russell, Princeton University; 3 years, Harlow Shapley, Solar Observatory; 2 years, H. D. Curtis, Lick Observatory; 1 year, J. M. Poor, Dartmouth College.

Member of the Council—S. A. Mitchell, University of Virginia.

Member of General Committee—E. B. Frost, Yerkes Observatory.

F. R. Moulton,
Secretary

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